BULLETIN

OF THE

TORREY BOTANICAL CLUB

VOL. 39

FOUNDED BY WILLIAM HENRY LEGGETT, 1870

EDITOR
PHILIP DOWELL

ASSOCIATE EDITORS

JEAN BROADHURST
ERNEST DUNBAR CLARK
ALEXANDER WILLIAM EVANS
MARSHALL AVERY HOWE
HERBERT MAULE RICHARDS
NORMAN TAYLOR

NEW YORK
1912
PUBLISHED FOR THE CLUB
THE NEW ERA PRINTING COMPANY
LANCASTER, PA.

PRESS OF
THE NEW ERA PRINTING COMPANY
LANCASTER PA

CONTENTS

BRITTON, NATHANIEL LORD. Studies of West Indian plants—IV - - 1
LIVINGSTON, BURTON E., and ESTABROOK, ARTHUR H. Observations on the degree of stomatal movement in certain plants - - - - - 15
MAXON, WILLIAM R. Notes on the North American species of Phanerophlebia - - - - - - - - - - - - - - - - 23
DORSEY, M. J. Variation in the floral structures of Vitis (plates 1–3) - 37
DACHNOWSKI, ALFRED. The relation of Ohio bog vegetation to the chemical nature of peat soils - - - - - - - - - - - - 53
SEAVER, FRED J. Studies in pyrophilous fungi—III. The viability of the spores of Pyronema (plate 4) - - - - - - - - - - 63
BICKNELL, EUGENE P. The ferns and flowering plants of Nantucket—IX 69
BRAINERD, EZRA. Violet hybrids between species of the palmata group (plates 5–7) - - - - - - - - - - - - - - - 85
RYDBERG, PER AXEL. Studies on the Rocky Mountain flora—XXVI - 99
FROMME, FRED D. Sexual fusions and spore development in the flax rust (plates 8, 9) - - - - - - - - - - - - - - - 113
DODGE, BERNARD O. Methods of culture and the morphology of the archicarp in certain species of the Ascobolaceae (plates 10–15) - - - 139
HOWE, R. HEBER, JR. The lichens of the Linnean Herbarium with remarks on Acharian material - - - - - - - - - - - - - 199
EVANS, ALEXANDER W. Hepaticae of Puerto Rico—XI (plates 16, 17) - 209
ROBINSON, WINIFRED J. A taxonomic study of the Pteridophyta of the Hawaiian Islands—I (plates 18–20) - - - - - - - - - 227
BROADHURST, JEAN. The genus Struthiopteris and its representatives in North America—I (plates 21, 22) - - - - - - - - - 257
LORENZ, ANNIE. Vegetative reproduction in the New England Frullaniae 279
SLOSSON, MARGARET. New ferns from Tropical America (plate 23)- - 285
MACKENSEN, BERNARD. Three new species of Opuntia, with a discussion of the identity of Opuntia Lindheimeri - - - - - - - 289
RYDBERG, PER AXEL. Studies on the Rocky Mountain flora—XXVII - 301
WILLISTON, RUTH. Discoid gemmae in Radula - - - - - - 329
BERRY, EDWARD W. Notes on the genus Widdringtonites (plates 24, 25)- 341
BROADHURST, JEAN. The genus Struthiopteris and its representatives in North America—II (plates 26–29) - - - - - - - - - 357
BERRY, EDWARD W. Contributions to the Mesozoic flora of the Atlantic coastal plain—VIII. Texas (plates 30–32) - - - - - - 387
DARLING, CHESTER ARTHUR. Mitosis in living cells - - - - - 407
BICKNELL, EUGENE P. The ferns and flowering plants of Nantucket—X - 415

255869

SKINNER, J. J., and BEATTIE, J. H. Effect of asparagin on absorption and growth in wheat (plate 33) - - - - - - - - - - 429
ALDEN, ISABEL. A contribution to the life history of Uvularia sessilifolia (plates 34, 35) - - - - - - - - - - - - - - - 439
ANDREWS, F. M. Protoplasmic streaming in Mucor - - - - - 455
SAFFORD, WILLIAM EDWIN. Desmos the proper generic name for the so-called Unonas of the Old World - - - - - - - - - 501
PICKETT, F. L. A case of changed polarity in Spirogyra elongata (plate 36) 509
DAVIS, BRADLEY MOORE. Was Lamarck's evening primrose (*Oenothera Lamarckiana* Seringe) a form of Oenothera grandiflora Solander? (plates 37–39) - - - - - - - - - - - - - - 519
SCHREINER, OSWALD, and SKINNER, J. J. The effect of guanidin on plants 535
ROBINSON, C. B. Polycodium - - - - - - - - - - - 549
ROBINSON, WINIFRED J. A taxonomic study of the Pteridophyta of the Hawaiian Islands—II (plates 40–44) - - - - - - - - - 567
EVANS, ALEXANDER W. New West Indian Lejeuneae—II (plate 45) - 603

INDEX TO AMERICAN BOTANICAL LITERATURE - - - - - - - 29, 81, 133, 205, 249, 293, 349, 411, 447, 511, 561, 613

INDEX TO VOLUME 39 - - - - - - - - - - - - 621

Dates of Publication

No. 1, for January.	Pages 1– 36.	Issued 10 February, 1912.
No. 2, for February.	37– 84.	9 March, 1912.
No. 3, for March.	85–138.	18 April, 1912.
No. 4, for April.	139–208.	17 May, 1912.
No. 5, for May.	209–256.	8 June, 1912.
No. 6, for June.	257–300.	10 July, 1912.
No. 7, for July.	301–356.	23 July, 1912.
No. 8, for August.	357–414.	16 August, 1912.
No. 9, for September.	415–454.	9 September, 1912.
No. 10, for October.	455–518.	2 November, 1912.
No. 11, for November.	519–566.	18 November, 1912.
No. 12, for December.	567–631.	31 December, 1912.

Errata

Page 96, line 8, for **Viloa** read **Viola.**
Page 152, line 4, for *Cubomia* read *Cubonia.*
Page 152, line 16, for *violaceus* read *violascens.*
Page 235, line 12 from below, for 1831 read 1827.
Page 244, line 2, for 1841 read 1832.
Page 244, line 7, for 1841 read 1844.
Page 246, line 5, for 1827 read 1829.
Page 246, line 4 from below, for 1827 read 1826.
Page 247, line 4 from below, for 1832 read 1829.
Page 248, line 20, for 1832 read 1827.
Page 313, line 22, for *calceoliformis* read *calceoliforme.*
Page 377, line 14, for *tubulare* read *tabulare.*

Vol. 39 No. 1

BULLETIN

OF THE

TORREY BOTANICAL CLUB

JANUARY 1912

Studies of West Indian plants—IV

NATHANIEL LORD BRITTON

16. DENDROPANAX IN THE WEST INDIES

1. DENDROPANAX ARBOREUM (L.) Dcne. & Planch.

A tree, up to 20 m. high, but usually much smaller and often flowering as a shrub. Leaves chartaceous, from ovate to obovate, mostly acuminate at the apex, narrowed or rounded at the base, often 2 dm. long; inflorescence from shorter than the leaves to equaling them, or longer, the 20 umbels or fewer racemosely arranged and umbellate at the summit, sometimes leafy-bracted, but the bracts usually small, ovate to lanceolate; peduncles of the umbels slender, ascending, up to 3 cm. long in fruit; pedicels 1½ to 3 times as long as the flowers, somewhat elongating in fruit; petals white or greenish; calyx rather sharply toothed, about 2 mm. wide at flowering time; fruit black, strongly lobed, 6–8 mm. thick.

Widely distributed at lower and middle altitudes in moist or wet districts in Jamaica, Cuba, Hispaniola, Porto Rico, and on Signal Hill, St. Thomas. Ascends to 1,600 meters in Jamaica.

2. DENDROPANAX SAMYDIFOLIUM (C. Wright) Seem.

This species is known to me only from the original specimens collected by Wright at S. Felepina near La Grifa, western Cuba; Wright's description calls for a tree up to 13 meters high. The leaf base is decurrent on the petiole. The species seems very closely related to *D. arboreum*, which is abundant in the mountains and hills of western Cuba.

[The BULLETIN for December 1911 (38: I–V, 531–570. *pl. 35*) was issued 6 Ja 1912.]

3. **Dendropanax brachypodum** (Urban) Britton nom. nov.

Gilibertia brachypoda Urban, Symb. Ant. 5: 452. 1908.

A short-petioled and long-pediceled Haitian mountain species, related to *D. arboreum*, known to me only from Professor Urban's description.

4. DENDROPANAX LAURIFOLIUM (E. March.) R. C. Schneider

A detailed description of this endemic Porto Rico mountain tree is published by Professor Urban in Symbolae Antillanae 1: 203.

5. DENDROPANAX CUNEIFOLIUM (C. Wright) Seem.

A shrub or tree up to 6 m. high, the branches slender, often drooping. Leaves spatulate to oblong-oblanceolate, 2 dm. long or less, 1.5–6 cm. wide, obtuse, or bluntly acute at the apex, cuneate at the base, the petiole 1/6 to 1/4 the length of the blade; peduncle slender, straight, as long as the leaves or longer; umbel 7–20-flowered; pedicels 1.5–2 cm. long; petals green, acute; flowering calyx about 4 mm. broad; fruit globose to globose-oblong, black, 6–8 mm. thick, the persistent style about half its length.

Banks of streams and wooded bogs at lower and middle elevations, Pinar del Rio and Isle of Pines, Cuba.

6. DENDROPANAX NUTANS (Sw.) Dcne. & Planch.

A shrub with stout gray branches. Leaves ovate to ovate-elliptic, coriaceous, 10 cm. long or less, acute or short-acuminate at the apex, narrowed or rounded at the base, the veins rather prominent on the under side, the stout petioles very unequal in length, sometimes two thirds as long as the blade; peduncle stout, 5–7 cm. long, bracted at or near the base; umbels many-flowered, inclined or nodding; pedicels 2–3 cm. long; flowering calyx 5 mm. broad.

Known only from Blue Mountain Peak, Jamaica, where it is reported as abundant. Professor Urban (Symb. Ant. 1: 200) characterizes the umbel as strictly erect, but it is inclined or nodding in all specimens seen by me.

7. DENDROPANAX PENDULUM (Sw.) Dcne. & Planch.

A shrub about 4 m. high. Leaves chartaceous in texture, ovate, acute or bluntish at the apex, rounded or subcordate at the base, triplinerved and rather prominently pinnately veined,

the blades 12 cm. long or less, nearly twice as long as wide; petioles rather stout, one half to two thirds as long as the blades; peduncle much longer than the leaves, pendulous, 2 dm. long or less, bracted and jointed a little below the middle; umbel many-flowered; pedicels slender, 15–18 mm. long; flowering calyx broadly turbinate, 3.5 mm. broad; petals oblong-lanceolate, about as long as the calyx.

Cockpit Country, Jamaica, *Harris 9188*, from Lapland, near Catadupa; this specimen agrees with the type specimen of *Hedera nutans* Sw., in the herbarium of the British Museum of Natural History. The species is also recorded by Marchand from Catharine's Peak, collected by *Eggers, 3651*, which I have not seen.

8. **Dendropanax grandiflorum** sp. nov.

A tree, about 8 m. high. Leaves chartaceous, obovate, 5–10 cm. long, 5 cm. wide or less, bluntly pointed at the apex, cuneate-narrowed at the base, rather strongly pinnately veined, the margins slightly revolute, the stout petioles about 1 cm. long or less; inflorescence of simple, terminal, few-flowered umbels, or rarely a secondary umbel borne halfway up on the peduncle; peduncle rather stout, 3–5 cm. long, bracted and jointed just above the base; flowers 8 or fewer in the umbels; pedicels rather stout, nearly erect, 1.5–2 cm. long; flowering calyx 8 mm. high, narrowly campanulate, its mouth 6–7 mm. broad; corolla 5 mm. long just before expanding, the bud rounded; anthers in the unopen bud about as long as the filaments; fruit oblong, 1 cm. long, 7 mm. thick, the persistent style 6–7 mm. long.

Peckham woods, Upper Clarendon, Jamaica, July 7, 1911, *Harris 10994*.

9. **Dendropanax elongatum** sp. nov.

A slender tree about 8 m. high. Leaves clustered at the ends of the branches, oblong to oblong-lanceolate, coriaceous, faintly pinnately veined, acute at the apex, narrowed or somewhat rounded at the base, the blade 15 cm. long or less; the petiole one sixth to one third as long as the blade; peduncle shorter than the larger leaves, 8–12 cm. long, bracted somewhat below the middle, the bracts triangular-ovate, apparently nearly erect; very young inflorescence depressed-hemispheric, 8 mm. broad; the flower buds sessile or nearly so.

Peckham woods, Upper Clarendon, Jamaica, at 800 to 900 meters elevation, January 3, 1910, *Harris 10874*.

The very young state of the inflorescence does not enable me to give a description of the flowers of this interesting tree, and its generic position is therefore uncertain. Its jointed and bracted peduncle is similar to that of *Dendropanax pendulum*, but its foliage is altogether different from that species.

10. **Dendropanax grande** sp. nov.

A tree up to 16 m. high. Leaves clustered at the ends of the branches, ovate to ovate-elliptic, coriaceous in texture, rather prominently pinnately veined, obtuse at both ends, the blade 15 cm. long or less, the stout petioles as long as the blades, or shorter; peduncle much shorter than the leaves, erect, stout, about 4 cm. long, bracted at the base; pedicels numerous, about 50, rather stout, 2 cm. long; flowering calyx subhemispheric, 5 mm. broad; petals lanceolate, about as long as the calyx; filaments rather stout, somewhat longer than the petals.

Moneague, Jamaica, *Alexander Prior*, May 1850.

11. **Dendropanax blakeanum** sp. nov.

A slender tree about 8 m. high. Leaves clustered near the ends of the branches, elliptic, or somewhat obovate-elliptic, rather coriaceous in texture, faintly pinnately veined, sharply acute at the apex, cuneate at the base, 10 cm. long or less; the petiole one fifth to one third as long as the blade; peduncle erect, as long as the leaves or twice as long, bracted at the base; umbels 8–16-flowered; pedicels slender, 2 cm. long in fruit; flower buds ovoid-hemispheric, obtuse, 3 mm. long just before the petals unfold; calyx in young fruit turbinate, 4 mm. broad; fruit subglobose, 5 mm. in diameter; the conic persistent style 2.5 mm. long.

John Crow or Blake Mountains, Jamaica, at 550 meters elevation, *Harris & Britton 10761*, collected March 10, 1909.

Differs from *Dendropanax nutans* in the longer, strictly erect, few-flowered peduncles, and in the venation, texture, and shape of the leaves.

12. **Dendropanax cordifolium** sp. nov.

A tree about 6 m. high. Leaves clustered at the ends of the branches, chartaceous in texture, broadly ovate, prominently pinnately veined, obtuse, or short-acuminate at the apex, cordate, or subcordate at the base, the blades 2 dm. long or less, about two thirds as wide as long, the stout petioles about one half as long as

the blades, or shorter; peduncle stout, bracted at and very near the base, inclined, longer than the petioles, 12–15 cm. long; umbels many-flowered; pedicels rather slender, 2.5 cm. long; flowering calyx broadly turbinate, 4–5 mm. broad; petals white, about as long as the calyx; filaments somewhat longer than the petals; persistent style of the young fruit very broadly conic, 2 mm. long or less.

Woodlands, summit of Dolphin Head, Jamaica, March 17, 1908, *Britton & Hollick 2856*.

17. THE GENUS CAMERARIA (PLUMIER) L.

The genus was accepted by Linnaeus from Plumier, *C. latifolia* being the type species, and *C. angustifolia* L. also appearing in the original publication of the genus, which is wholly West Indian in distribution, so far as I am aware.

1. CAMERARIA LATIFOLIA L. Sp. Pl. 210. 1753

This is a shrub or tree up to 15 m. high, as observed by me at the United States Naval Station, Guantanamo Bay, Cuba. It has characteristic ovate-elliptic acuminate leaves. Its fruit is about 6 cm. long. The species seems to be widely distributed in Cuba; occurring in the provinces of Oriente, Matanzas, and Havana. In Jamaica it is apparently rare, the only specimen seen by me being one collected by Dr. A. Hollick and myself (*2045*) in rocky woods at Negril, the extreme western end of that island. It is recorded from Haiti but I have seen no specimens from Hispaniola, which is presumably the type locality.

2. CAMERARIA ANGUSTIFOLIA L. Sp. Pl. 210. 1753

My knowledge of this species rests wholly on Plumier's description and *plate 72, figure 2*, where it is illustrated as having linear-acuminate leaves and fruit 2.5 cm. long. According to Miller, cited by Grisebach, Fl. Br. W. I. 410, it was found in Jamaica, but it is unknown to us from that island.

3. CAMERARIA RETUSA Griseb. Fl. Br. W. I. 410. 1861

(C. *angustifolia* Griseb. loc. cit. not L.)

This is wholly a Cuban species, so far as it is represented in our collections, occurring in the provinces of Santa Clara, Havana,

Pinar del Rio, and on the Isle of Pines. It has lanceolate to oblong leaves, which are obtuse and emarginate at the apex. Its fruit is about 2 cm. long, the narrowly linear terminal wing about as long as the ovoid body. Its flowers are only about 1 cm. long, the corolla limb about 1.5 cm. wide.

I take as the type of this species the specimen from "West Indies," collected by *Lane*, and preserved in the Kew Herbarium.

4. **Cameraria oblongifolia** sp. nov.

A tree 4–6 m. high with slender twigs. Leaves oblong to oblong-lanceolate, acutish to obtuse or minutely emarginate at the apex, narrowed at the base, 2–3.5 cm. long, 14 mm. wide or less, the slender petiole about 2 mm. long; corolla about 17 mm. broad; fruit compressed, lanceolate, 2–3 cm. long, about 1 cm. wide, grooved at the base on one side, the terminal wing oblong-triangular, obtuse, about as long as the body.

In wet woods near Tiffin, Camagüey, November 1–5, 1909, *Shafer 2877*; also represented by part of Wright's Cuban *no. 2950*, collected at Hanabana.

The other part of Wright's *2950*, which has ovate-lanceolate acuminate leaves, may represent another species. It has much more slender and longer petioles than *C. oblongifolia*, but the specimens examined by me are too imperfect to afford a complete description. Combs' *no. 19*, collected in Cieneguita in the province of Santa Clara, appears to be the same as this, but our specimen of that number also is incomplete.

5. **Cameraria microphylla** sp. nov.

A tree up to 5 m. high, intricately branched, the twigs very slender. Leaves oblong to oblong-obovate, 1 cm. long or less, 2–4 mm. wide, emarginate at the apex, narrowed at the base, the margins strongly revolute; fruit 2 cm. long, 4–6 mm. wide, compressed, the wing oblique, sinuate, terminal and lateral, similar to that of *C. latifolia* but very much smaller.

Near the northwestern end of Cayo Coco, Camagüey, October 23–24, 1909, *Shafer 2709*.

18. UNDESCRIBED SPECIES FROM JAMAICA

Acalypha jamaicensis sp. nov.

A shrub, 2–2.7 m. high, the branches slender, the young ones densely pubescent. Leaves oblong-lanceolate to oblong-oblanceolate, thin in texture, rather strongly pinnately veined, 9–15 cm. long, 3–5 cm. wide, sharply serrate all around, long-acuminate at the apex, subcordate at the base, sparingly pubescent above, rather densely pubescent on the veins beneath, the slender pubescent petioles 4 cm. long or less; flowers apparently monoecious; staminate spikes dense, pubescent, slender-stalked, about 3 cm. long, the short narrow bracts ciliate; pistillate spikes 3–6 cm. long, their bracts ciliate and pubescent, especially on the veins, 5–7-cleft to about the middle, the lobes obtuse or acutish; style dissected into filiform segments; fruit compressed, pubescent, 2 mm. broad.

Woodlands, Upper Clarendon, Jamaica. Type, *Harris 10842*, collected at Leicesterfield, January 28, 1910.

Related to *A. pruinosa* Urban, a nearly glabrous species with more deeply cleft pistillate bracts.

Actinostemon jamaicensis sp. nov.

A tree, up to 10 m. high, with slender, somewhat drooping branches, glabrous throughout. Leaves ovate to oblong-lanceolate, thin, 5–7 cm. long, 2–3.5 cm. wide, acuminate at the apex, rounded or narrowed at the base, shining above, pale beneath, pinnately veined, the very slender petioles 1 cm. long or less; staminate inflorescence interruptedly spicate, slender, 4–5 cm. long, flowers opposite the upper leaves; stamens 12, in clusters of 3, the united part and the free part of the filaments about equal in length; fruit depressed-globose, 9–12 mm. broad, 8–9 mm. high, both apex and base slightly sunken; seed globose, 3–3.5 mm. in diameter.

Thickets, Grant's Pen, near Yallah's Bay, Jamaica, May 26, 1911, *Harris 10936*, type; also at the same station, *Harris 10643*, *10818*, and *10826*, *Britton 3470* and *3913;* coastal thickets, Morant Point, *Britton 4103*.

Clusia clarendonensis sp. nov.

A small tree, up to 5 meters high. Leaves thick, rigid, obovate, 10 cm. long or less, 5–7 cm. wide, rounded at the apex, narrowed at the base, finely but rather strongly pinnately veined, the stout

petioles 4–6 mm. long; fruiting peduncles stout, 3 cm. long; inflorescence about 3-flowered; fruiting pedicels about 1 cm. long; bracts triangular-ovate, acute, rigid, 5 mm. long; fruit oblong, obtuse, 2.5 cm. long, 1.5 cm. thick, the persistent sepals broadly triangular-ovate, scarious-margined; stigmas 5.

Peckham woods, Upper Clarendon, Jamaica, in fruit July 7, 1911, *Harris 10992*. Related to *C. venosa* Jacq.

Maytenus clarendonensis sp. nov.

A tree, up to 18 meters high. Leaves broadly elliptic, coriaceous, obtuse at both ends, 8–10 cm. long, 5–7 cm. wide, strongly revolute-margined, shining above, dull, and the veins rather prominent beneath, the stout petioles 1 cm. long or less; fruiting pedicels about 6 mm. long; capsules oblong, pointed at both ends, 15–18 mm. long, 8 mm. thick, roughened with depressed tubercles.

Peckham woods, Upper Clarendon, Jamaica, in fruit July 5, 1911, *Harris 10947*. Related to *M. jamaicensis* Krug & Urban.

Portlandia Harrisii sp. nov.

A small tree up to 6 meters high. Leaves orbicular, coriaceous, sessile, 8–10 cm. long and broad, rounded at the apex, cordate at the base, shining and reticulate-veined on both surfaces; stipules broad, obtuse; flowers 2–5 together in the upper axils, about 5 cm. long; corolla campanulate, the tube apparently about as long as the limb; fruiting pedicels stout, 6–8 mm. long; immature capsules obovoid, obtusely 5-angled, 2 cm. long, 1.5 cm. thick, crowned by the short calyx teeth.

On limestone rocks, Peckham woods, Upper Clarendon, July 6, 1911, *Harris 10975*. Only old withered fallen corollas were obtained.

Rondeletia saxicola sp. nov.

A shrub about 4 meters high, the twigs pilose-pubescent. Leaves thin, oblanceolate to oblong, acute at the apex, narrowed at the base, rather dark green and loosely appressed-pubescent above, paler green and loosely pilose-pubescent at least on the veins beneath, pinnately veined, 7–10 cm. long, 3 cm. wide or less, the pilose petioles about 1 cm. long; flowers in short-stalked globose clusters about 1 cm. in diameter, the rather stout, densely pubescent peduncles 5–8 mm. long; bracts linear, acute, 5–8 mm. long; calyx 4 mm. long, pubescent, lobed to below the middle, the lobes narrowly lanceolate, acute; fruit pubescent, about 5 mm. thick.

Rocky Cliff, Somerset, Manchester, September 23, 1908, *Harris & Britton 10609*.

Bidens clarendonensis sp. nov.

Perennial, glabrous, the stem and branches terete, trailing, somewhat woody. Leaves firm in texture, 4–7 cm. long,r hombic-ovate, acute at the apex, rather coarsely serrate, except at the broadly cuneate base, with slightly incurved gland-tipped teeth with revolute margins, the venation rather prominent, the petioles one fourth to one third as long as the blades; heads several together, on stalks 1.5 cm. long or less; involucre nearly hemispheric, many-flowered, its bracts about 1 cm. long, linear, obtuse or with a triangular acutish tip, 1.5–2 mm. wide; ray flowers about 5, 1.5–2 cm. long, the rays oblong, orange yellow, 2-toothed, 6–7 mm. wide, the tube about 3 mm. long; disk flowers 6 mm. long, the cylindric limb acutely 5-toothed; achenes 1 cm. long, less than 0.5 mm. thick, pappus of 1 or 2 subulate awns about 0.5 mm. long at flowering time, becoming 2 mm. long and downwardly barbed at maturity.

Peckham woods, Upper Clarendon, July 7, 1911, *Harris 10987*.

19. UNDESCRIBED SPECIES FROM CUBA

Mettenia acutifolia Britton & Wilson sp. nov.

A slender tree, 3–8 m. high, with hirsutulous twigs and petioles. Leaves ovate, occasionally lanceolate, 2–6 cm. long, 1–3.4 cm. broad, bluntly acuminate at the apex, rounded and equilateral or nearly so at the base, obscurely reticulate-veined and more or less pubescent with blackish hairs along the midrib and lateral veins above, hirsutulous on the midrib and lateral veins beneath, the margin ciliate; flowers unknown; valves of the capsule with crowded conic or subpyramidal tubercles, each tubercle tipped with a hair; seeds (immature) brownish black, lustrous, 4 mm. long, 3 mm. broad.

Camp La Gloria, south of Sierra Moa, Oriente, Cuba, December 30, 1910, *Shafer 8250*. Distinguished from *M. globosa* (Sw.) Griseb. by its spreading pubescence and by its pointed leaves.

Clerodendron (?) **calcicola** sp. nov.

A tree, 8 m. high, the branches smooth, the bark flaky in narrow strips. Leaves opposite, coriaceous, ovate to ovate-elliptic,

distantly low-serrate, 10 cm. long or less, 3–5 cm. wide, glabrous, shining and with the inconspicuous venation somewhat impressed above, pale, strongly reticulate-veined with elevated venation, and rather densely pubescent beneath, the stout nearly terete petioles puberulent, 8–12 mm. long; flowers and fruit unknown.

Apparently related to *C. spinosum* Urban, of Santo Domingo, which has similar leaves with bristle-tipped teeth and villous petioles.

Pseudocarpidium pungens sp. nov.

A tree 8 m. high, the twigs slender. Leaves oblong to oblong-lanceolate, 3–7 cm. long, 3 cm. wide or less, chartaceous, strongly pinnately veined, spinulose-dentate, the apex acuminate, spinulose-tipped, the base obtuse, the upper surface smooth and shining, the under surface dull and puberulent; fruit irregularly 4-lobed, puberulent, depressed, 8 mm. in diameter.

Hillside, near Guantanamo, Oriente, Cuba, March 1909, *Britton 1992*, type; Sevilla Estate, near Santiago, Oriente, Cuba, *Norman Taylor 19*.

Related to *P. avicennioides* (A. Rich.) Millsp., which has entire leaves and more deeply lobed fruit.

Pseudocarpidium rigens (Griseb.) Britton comb. nov., *Vitex rigens* Griseb., has glabrous oblong to oblanceolate shining leaves, spinulose-dentate, at least above the middle, or some of them entire.

Portlandia nitens sp. nov.

A slender shrub, about 3 meters high. Leaves sessile, coriaceous, broadly ovate-elliptic, rounded at the apex, cordate or subcordate at the base, inconspicuously pinnately veined, shining above, dull beneath, 9 cm. long or less, the upper much smaller than the lower; flowers corymbose; pedicels short, viscid; calyx viscid, its lobes linear, about 8 mm. long; corolla pink, campanulate, 2.5 cm. long; capsule obovoid-oblong, 13 mm. long.

Dry thicket, upper valley of the Rio Navas, Oriente, March 22, 1910, *Shafer 4450*.

Elaeagia cubensis sp. nov.

A shrub, up to 3.2 meters high, the branches rather stout, the young twigs, branches of the inflorescence, and pedicels minutely pubescent. Leaves chartaceous, oblong or oblong-obovate, 7 cm. long or less, 2.5–3 cm. wide, abruptly short-acuminate at the apex,

narrowed at the base, strongly pinnately veined, the petioles 6–9 mm. long; stipules narrow, obtuse, deciduous, 1 cm. long; panicles rather loosely flowered, 7 cm. long or less, minutely bracteolate; pedicels 2–3 mm. long; calyx tube obconic, 2 mm. long, the limb with 5 short rounded lobes; corolla white, 4 mm. long, its narrowly oblong lobes twice as long as the tube; filaments about as long as the corolla, the scale near the base of each with a dense tuft of white hairs; stigmas one fourth as long as the style.

Monte Jiquarito, Sierra Maestra, Oriente, Cuba, at about 1,100 meters altitude, September 18, 1906, *Norman Taylor 515*.

The genus has been hitherto known only from the South American Andes.

20. NOTES ON SPECIES OF SOLANUM

SOLANUM BLODGETTII Chapm.

This species is cited by Mr. O. E. Schulz* as a synonym of *Solanum bahamense subarmatum* (Willd.) O. E. Schulz, but he has wholly misunderstood its type specimens, which show that it is more nearly related to *S. verbascifolium* than to *S. bahamense;* it grows plentifully on Key West, Florida (*Blodgett*, type; *Merrill; Pollard, Collins & Morris 3; Britton 520; Lansing 1969*), in the Florida Everglades (*Britton 237; Small & Wilson 1678, 1962; Small & Carter 2674, 2675, 2936, 3101*), and is to be added to the West Indian Flora, as it occurs on Cat Cay, Bahamas (*Millspaugh 2341; Brace 3749*).

The varietal name *Solanum bahamense subarmatum*, under which Mr. Schulz groups nearly or quite unarmed specimens of *S. bahamense*, is redundant, for there is every transition from very prickly plants to entirely unarmed ones throughout the range of the species, individual bushes often bearing prickles below and being quite devoid of them above. *Harris 8169*, from Plowden Hill, Jamaica, as represented by our specimen, is unarmed, though the duplicate of it, examined by Mr. Schulz, is referred by him to the typical prickly form.

SOLANUM BOLDOENSE A. DC.

This interesting Cuban vine is apparently of quite local distribution at widely separated stations; about Matanzas it

* Urban, Symb. Ant. 6: 223.

grows especially in the famous gorge of the Yumury or Yumuri River (*Rugel 145*). Mr. Schulz (loc. cit. 170) erroneously spells this "Tomory," while Mr. A. H. Moore* also has it wrong as "Sumuri." This gorge is one of the scenic attractions of the northern coast of Cuba; the handwriting of Rugel's labels is somewhat difficult to decipher. In Pinar del Rio it inhabits limestone rocks at San Diego de los Baños (*Britton, Earle & Gager 6674*); C. Wright's specimen *381* was collected in Oriente; the locality of the type specimen is doubtfully cited as Havana.

21. NOTES ON TWO JAMAICA PLANTS

AMPELOCISSUS ALEXANDRI Urban, Symb. Ant. **6**: 15. 1909

To the description may be added "berry depressed-globose, black, shining, 1.5 cm. in diameter, the pulp watery; seeds 2 or 3, depressed-obovoid, slightly rugose, rather deeply and broadly grooved, 5 mm. long, 4 mm. wide."

Wooded hillside, Union Hill near Moneague, St. Ann's, Jamaica, at 500 meters altitude, *Britton & Hollick 2767;* this station is within a few miles of the type locality at Mount Diablo.

TABERNAEMONTANA DISCOLOR Sw. Prodr. 52. 1788

Tabernaemontana ochroleuca Urban, Symb. Ant. **6**: 34. 1909.

An examination of the type specimen of Swartz' species in the herbarium of the British Museum of Natural History establishes the identity of these species.

22. THE GENUS GINORIA IN CUBA

GINORIA AMERICANA Jacq.

As intimated by Koehne (Bot. Jahrb. **3**: 349) this species may sometimes bear spines, as observed by me on plants in the palm barren at Santa Clara, in March, 1910 (*Britton & Wilson 6093*). This shrub grows along brooks and streams, attaining a height of 2.5 meters, at lower elevations in all provinces of Cuba, ascending to 160 meters in Oriente.

* Proc. Am. Acad. **42**: 530.

GINORIA SPINOSA Griseb. Cat. Pl. Cub. 106. 1866

I know this only from *Wright's 2545*, collected in eastern Cuba (not western Cuba, as cited by Koehne). Rugel's *727* from the Rio San Juan at Matanzas, as shown by our specimen, is certainly *G. americana* Jacq. and was so written up by Grisebach, though this number, as studied by Koehne, is by him referred to *G. spinosa*. The true *G. spinosa* Griseb. (*Wright 2545*) is quite a different plant, with much smaller leaves and acicular spines; it is possible, however, that the species are not distinct.

GINORIA GLABRA Griseb. Cat. Pl. Cub. 106. 1866

Known to me from Wright's *2544*, collected in eastern Cuba; and from Shafer's *8784*, collected at Farallon de la Perla, Oriente, where it grows on cliffs as a shrub 6 dm. high. It is evidently quite distinct from the other species.

Ginoria arborea sp. nov.

A tree, 8 meters high, the trunk up to 2.5 dm. thick, the bark gray, the branching irregular, the twigs of the season 4-angled with internodes 5–15 mm. apart; nodal spines 4, spreading, recurved, yellowish, 1–1.5 mm. long. Leaves sessile, linear-oblong, 1.5–3 cm. long, 2–5 mm. wide, coriaceous, bright green, shining, obtuse at the apex, narrowed at the base, strongly pinnately veined, the veins prominent on both surfaces; flowers solitary in the axils; pedicels filiform, a little shorter than the leaves; sepals triangular-lanceolate, acute, 4 mm. long.

Thicket, Leeward Point, United States Naval Station, Guantanamo Bay, Cuba, March 1909, *Britton 2217*.

GINORIA CURVISPINA Koehne, loc. cit. 349. 1882

In the palm barren near Santayana, Camagüey, this species is a shrub 1 meter high (*Britton 2368*); near Tiffin, Camagüey, it grows in wet woods and becomes nearly 3 meters high.

Ginoria ginorioides (Griseb.) Britton comb. nov.

Diplusodon ginorioides Griseb. Cat. Pl. Cub. 106. 1866.
Ginoria Diplusodon Koehne, Bot. Jahrb. 3: 350. 1882.

This beautiful shrub or tree inhabits cliffs and rocky hillsides; in the province of Santa Clara it ascends to 560 meters on the

southern slope of the Trinidad Mountains, and at sea level on the southern coast becomes a tree up to 7 meters high; the flowers are rose pink to purple and densely cover leafless branches in March.

NEW YORK BOTANICAL GARDEN.

Observations on the degree of stomatal movement in certain plants*

BURTON E. LIVINGSTON AND ARTHUR H. ESTABROOK

The studies of Lloyd† and of Livingston‡ on the relation of stomatal changes to the rate of plant transpiration have rendered it very desirable that some quantitative information upon the opening and closing of stomata in a large number of plants be made available. Primarily, such knowledge should hasten the acquisition of some generalization upon the relation between stomatal changes and the daily march of water loss in plants, a generalization that seems to be utterly lacking at the present time.

We give, therefore, in the present paper, the results of a series of stomatal measurements on several different plant forms and at various hours of the day. Limitations in facilities and time prevented the testing of a larger number of forms as well as the undertaking of a study of the problem of stomatal influence upon transpiration as such; we have confined ourselves to an effort to determine approximately the degree of usual stomatal change which occurs between day and night under a somewhat widely representative complex of climatic conditions. The plants with which we have worked were all growing in the open soil in the recently established Botanical Garden of the Johns Hopkins University at Homewood, Baltimore, Maryland. The plants used were *Funkia ovata*, *Isatis tinctoria*, *Allium Cepa*, *Eichhornia speciosa*, and *Oenothera biennis*.

Following Lloyd's method,§ at various times of day and night samples of epidermis were stripped from the leaves without removal of the latter from the plants, and were quickly placed in absolute alcohol contained in suitable vials. Different but similar leaves of the same plant were used for any single series of observations. At a later time the samples were mounted in a solution of

* Botanical contribution from The Johns Hopkins University No. 27.

† Lloyd, F. E. The physiology of stomata. Publ. 89 Carnegie Inst. 1908.

‡ Livingston, B. E. Stomata and transpiration in *Tradescantia zebrina*. Science II. 29: 269, 270. 1909.

§ Loc. cit. p. 26.

iodin in absolute alcohol and the determinations made microscopically. These consisted in finding the mean number of stomata occurring per unit area, on either side of the leaf, and measuring with ocular micrometer the length and breadth of the stomatal openings. Twenty stomata, taken at random, were measured in each case. It was found by repeated tests that the average result obtained from twenty stomata was not considerably altered by employing a larger number; a higher degree of accuracy than that here obtained would entail no great difficulty, but would be quite useless in the present state of our knowledge.

That the stomatal openings in the bits of epidermis fixed in alcohol by the method of Lloyd are generally unaltered by this treatment, is attested by Lloyd himself, by Miss S. Eckerson* and by Renner.† Since the method depends for its efficiency upon the rapidity with which the walls of the guard cells are dehydrated, it is clear that the reagent used must contain not more than a certain amount of water. We are not aware that this question of the requisite purity of the alcohol to be used in this sort of work has heretofore received attention in a quantitative way, and therefore present here the result of an extensive test in this regard, using the stomata of *Eichhornia* as subject. The bits of epidermis were placed in a series of "alcohols," ranging from absolute to 80 per cent (volume). We were surprised to discover that, for these stomata at least, 90 per cent alcohol was apparently as satisfactory for our purpose as was absolute. With over 10 per cent of water a slight closure of previously open stomata could be detected. With more than 20 per cent of water this induced closure was marked. In spite of these indications we persisted in the use of absolute alcohol for all the tests.

To bring out the method of handling the dimension data, TABLE I is presented. It includes the results of measurements of *Allium* stomata at 3:00 p. m. and at 12:30 a. m. Under each hour are first shown the actual dimensions, *a* and *b* (the long and short dimensions of the more or less elliptical cross sectional area

* Eckerson, Sophia H. The number and size of stomata. Bot. Gaz. **46**: 221–224. 22 S 1908.

† Renner, O. Beiträge zur Physik der Transpiration. Flora **100**: 451–547. 1910.

TABLE I

Allium Cepa

August 30, 3:00 p. m.		August 31, 12:30 a. m.	
Dimensions of openings, *micra* ($a \times b$)	$\sqrt{ab}$	Dimensions of openings, *micra* ($a \times b$)	$\sqrt{ab}$
15 ×4.2	7.94		
15 ×6	9.49	12.6 ×3	6.15
15 ×6	9.49	12 ×4.5	7.35
15 ×6	9.49	Remainder closed	
15 ×6	9.49		
15 ×5.7	9.25		
14.1 ×4.2	7.70		
15 ×4.2	7.94		
15 ×3.6	7.35		
13.5 ×3.9	7.26		
12.9 ×4.2	7.36		
12.9 ×4.5	7.62		
13.2 ×6	8.90		
14.1 ×4.5	7.97		
18 ×3.9	8.38		
12.6 ×4.8	7.78		
15 ×6	9.49		
12.9 ×4.5	7.62		
15 ×6	9.49		
12.9 ×5.1	8.11		
Mean $\sqrt{ab}$ (the index of relative diffusive capacity) is 8.40.		Mean $\sqrt{ab}$ (the index of relative diffusive capacity) is 0.685.	

of the stomatal pore). These are expressed in the form of an indicated product. In the second column of each series is shown the square root obtained, in each case, from the product of a and b. If we assume that the stomatal pore is elliptical in cross section, then the derived square root must represent the diameter of a circle with area equivalent to that of the ellipse in question. If minute elliptical openings allow the passage of diffusing gases at approximately the same rate as do circular openings of the same cross sectional area,* and also if such rates of gas diffusion through minute circular openings are proportional, not to cross sectional areas but to similar linear dimensions (as the diameters) of the openings;† then it follows that the square roots given in the

* Brown, H. T., and Escomb, I. Static diffusion of gases and liquids in relation to the assimilation of carbon and translocation in plants. Phil. Trans. Roy. Soc. London **193**: 283–291. 1900.

† Stefan, J. Versuche über die Verdunstung. Sitzber. K. Akad. Wiss. Wien, math. nat. Kl. **68**: 385–428. 1873. This contribution formed the point of departure for the work of Brown and Escomb (loc. cit.). See also, on this subject, Renner (loc. cit.).

table should be proportional, under otherwise identical conditions, to the rate of diffusion of water vapor through the corresponding stomatal pores. The studies of Brown and Escomb have left no doubt in regard to the validity of the principle of linear dimensions, as regards minute circular openings. The two assumptions, (1) that the configuration of the cross section of the stomatal pore nearly enough approaches that of an ellipse to permit the use of such calculations as ours, and (2) that diffusion through minute elliptical openings occurs at the same rate as through circular ones of the same cross sectional area, need further substantiation, but they are highly probable and at least carry us much further toward the inception of a quantitative knowledge of stomatal diffusive capacity than can any other method of treatment thus far available. While it is undoubtedly true that a stoma may close very considerably without at the same time producing alteration in the long axis of the ellipse, yet by the time closure is nearly completed that axis has shortened markedly in many plants. We are thus convinced that to assume the long axis as constant and compute diffusive capacities on the basis of the length of the short axis alone is a method not generally applicable.

If the square root of the product of the two elliptical axes may be taken as proportional to the diffusive capacities of the stomata involved, that is, to their power of transmitting water vapor, then the mean of the square roots derived from all measurements should be a relative measure of the average stomatal diffusive capacity at the hour of sampling. At the base of each part of TABLE I is given this mean.

It is seen at once from TABLE I that all stomata were open at the hour of daylight observation while the majority were closed at the night hour. The two open pores, out of twenty observed for the night hour, are seen to be less widely open than were any at the other time. All conditions being equal excepting that of the size of opening, the diffusive capacity of the stomata appears to be approximately 69/840, or 8.2 per cent as great at about midnight as at 3 in the afternoon.

In TABLE II are given the final results of the calculation for each case tested. Two series are presented, one carried out on August 30 and 31, the other on September 7 and 8, 1910. Besides

the calculated diffusive capacities, are given the minima, means, and maxima of the actual dimensions. These latter are expressed as a series of three quantities, the middle one, in full face type, being the mean. The two series thus given for each hour represent, of course, the two axes of the stomatal ellipse. The number of stomata per square millimeter of leaf surface is given above the data in each case, excepting that of *Allium*, where it was not determined. *Funkia* has stomata only below and *Allium* has but one leaf surface to be considered.

It appears from our results that the diffusive capacity of the stomatal openings reached the zero point at night in all cases excepting *Allium*, *Eichhornia*, and the lower leaf surface of *Oenothera*. This is not to be taken as meaning even that stomatal transpiration actually ceased when the index of diffusive capacity, as here determined, vanished. There must always be some stomata that are SLIGHTLY open, and SOME diffusion undoubtedly may occur when closure is apparently complete. Of course, cuticular transpiration must continue whether the stomata are open or closed.

The greatest diffusive capacities are exhibited by the aquatic *Eichhornia*, and the stomata of this plant are clearly seen to alter

TABLE II

Funkia

Time of observation	Lower leaf surface (54 stomata per sq. mm.)	
	Dimensions of openings, *micra*	Index of relative diffusive capacity
Aug. 30		
3:00 p. m.	0.6–**0.5**–3.0 × 10.0–**11.0**–15.0	3.93
6:30 p. m.	0 × 0	0.00
Aug. 31		
12:30 a. m.	0.0–**0.27**–3.0 × 0.0–**1.0**–11.4	0.54
5:30 a. m.	0.0–**1.08**–4.5 × 0.0–**3.6**–15.0	1.95
10:00 a. m.	0.0–**1.3**–3.0 × 0.0–**6.5**–15.0	2.88

TABLE II—*Continued*

Isatis

Time of observation	Upper leaf surface (173 stomata per sq. mm.)		Lower leaf surface (182 stomata per sq. mm.)	
	Dimension of openings, *micra*	Index of relative diffusive capacity	Dimension of openings, *micra*	Index of relative diffusive capacity
Aug. 30				
3:00 p. m.	0.0–**2.4**–4.5 × 0.0–**8.9**–13.5	4.56	0.0–**2.5**–4.8 × 0.0–**9.5**–15.0	4.77
6:30 p. m.	0 × 0	0.00	0.0–**0.15**–3.0 × 0.0–**0.45**–9.0	0.27
Aug. 31				
12:30 a. m.	0 × 0	0.00	0 × 0	0.00
5.30 a. m.	0 × 0	0.00	0.0–**0.08**–1.5 × 0.0–**0.53**–10.5	0.21
10:00 a. m.	0.0–**0.66**–3.0 × 0.0–**2.1**–13.5	1.17	0.0–**2.2**–4.2 × 0.0–**9.9**–1.50	4.65

TABLE II—*Continued*

Allium Cepa

Time of observation	Dimensions of openings, *micra*	Index of relative diffusive capacity
Aug. 30		
3:00 p. m.	3.6–**5.0**–6.0 × 12.6–**14.4**–18.0	8.40
6:30 p. m.	3.0–**4.2**–6.0 × 12.0–**13.0**–15.0	7.32
Aug. 31		
12:30 a. m.	0.0–**0.38**–4.5 × 0.0–**1.23**–12.6	0.68
5:30 a. m.	3.0–**5.4**–7.5 × 9.0–**13.2**–15.6	8.37
10:00 a. m.	5.4–**7.5**–9.0 × 15.0–**19.3**–24.6	12.03

TABLE II—*Continued*

Eichhornia

Time of observation	Upper leaf surface (182 stomata per sq. mm.)		Lower leaf surface (91 stomata per sq. mm.)	
	Dimensions of openings, *micra*	Index of relative diffusive capacity	Dimensions of openings, *micra*	Index of relative diffusive capacity
Aug. 30				
3:00 p. m.	———	——	———	——
6:30 p. m.	9.0–**11.7**–12.0 × 18.0–**21.2**–24.0	15.75	4.8–**7.3**–9.0 × 22.5–**25.2**–27.6	13.53
Aug. 31				
12:30 a. m.	4.5–**7.5**–12.0 × 15.0–**19.8**–24.0	12.09	1.8–**5.6**–9.0 × 18.0–**23.1**–27.0	11.31
5:30 a. m.	4.5–**9.2**–11.4 × 18.6–**21.0**–24.0	13.89	3.9–**6.7**–12.0 × 20.1–**22.7**–27.0	12.27
10:00 a. m.	6.0–**11.1**–15.9 × 16.5–**22.8**–27.0	15.81	6.9–**10.1**–12.0 × 19.5–**22.6**–26.4	15.06

TABLE II—*Continued*

Oenothera biennis

Time of observation	Upper leaf surface (71 stomata per sq. mm.)		Lower leaf surface (364 stomata per sq. mm.)	
	Dimensions of openings, *micra*	Index of relative diffusive capacity	Dimensions of openings, *micra*	Index of relative diffusive capacity
Sept. 7				
1:00 p. m.	3.6–**5.1**–6.3 × 7.5–**10.0**–13.2	7.11	4.2–**5.55**–6.3 × 8.7–**10.9**–18.0	7.74
3:45 p. m.	3.0–**4.3**–6.0 × 6.3–**9.8**–15.0	6.42	0.0–**2.2**–5.1 × 0.0–**7.2**–12.9	4.23
6:20 p. m.	2.4–**3.3**–4.8 × 7.8–**10.4**–12.0	5.82	0.0–**1.6**–3.6 × 0.0–**6.5**–12.9	3.18
11:40 p. m.	0 × 0	0.00	0.0–**1.6**–3.0 × 0.0–**5.5**–12.0	2.91
Sept. 8				
5:40 a. m.	1.8–**3.8**–5.1 × 6.0–**9.2**–13.5	5.85	0.0–**2.3**–4.2 × 0.0–**6.7**–15.0	3.87
11:00 a. m.	3.0–**4.4**–6.0 × 6.0–**10.1**–15.0	6.63	1.8–**2.9**–4.5 × 6.3–**10.1**–12.6	5.34

their openings from day to night, though to a relatively slight degree. The diffusive capacity at night is about 12/16 (75 per cent) of its day magnitude for the upper leaf surface, and 11/15 (73.3 per cent) for the lower. Furthermore, *Eichhornia* possesses by far the largest daylight openings with which we have dealt. Next in order are *Allium* with an open capacity about half as great as in *Eichhornia*, and *Oenothera* with an open capacity somewhat less than that of *Allium*. *Funkia* and *Isatis* are not widely different from each other in the diffusive capacity of their open stomata, which is approximately half as great as that of *Allium*. A comparison of the amount and rate of stomatal closure, as exhibited by the two sides of the leaf, indicates that the upper stomata close and open more rapidly, or close more completely, than do the lower, though this difference is not pronounced in *Eichhornia*.

Many other points of interest are suggested by the data of TABLE II, but the time is not ripe for more detailed discussion; our aim in presenting these results has been merely to make a beginning in the acquisition of information upon which somewhat critical and quantitative studies may be based. It is hoped that others will attack this problem, so that the theory of stomatal effects may, as soon as may be, be brought to rest upon a more adequate foundation of actual measurements than is at present the case.

LABORATORY OF EXPERIMENTAL EVOLUTION,
JOHNS HOPKINS UNIVERSITY.

Notes on the North American species of Phanerophlebia*

WILLIAM R. MAXON

In determining recently two species of *Phanerophlebia* collected by the writer in the mountains of Chiriqui, in western Panama, it became necessary to go somewhat critically over most of the material of this genus in the U. S. National Herbarium. Specimens have been received from various sources during the past twelve years, so that it is now possible to separate the species somewhat more exactly than at the time of Dr. Underwood's revision of the genus,† and partly by the use of characters not previously emphasized. The following key and notes are offered merely as supplementing that treatment. One species, *P. guatemalensis*, appears not to have been well founded.

Key to the North American species of Phanerophlebia

Venation copiously areolate.

Plants of lax spreading habit; pinnae few (5–11), normally 3.5–5 cm. broad; veins distant (mostly 3–3.5 mm. apart), spreading at a very wide angle; sori distinctly inframedial upon the veinlets, the first row distant usually about 2 mm. from the midvein, the other sori similarly situated or often nearly basal upon the branches. 1. *P. juglandifolia.*

Plants apparently of more upright habit; pinnae numerous (16–20), mostly 2–3 cm. broad; veins closer, usually 2–2.5 (rarely 3) mm. apart, much more oblique; sori medial or supramedial (rarely subterminal), the first row usually 3–5 mm. distant from the midvein. 3. *P. remotispora.*

Venation wholly free, or the veins casually anastomosing near the margin.

Pinnae 3–5, cordate or at least subcordate at the base. 2. *P. pumila.*

Pinnae 10–30, variously cuneate, or unequally rounded or auriculate at the base, never cordate.

Sori borne in a definite zone much nearer the margin than the midvein. 5. *P. umbonata.*

Sorioccupying a medial zone or generally distributed over the pinna.

---

* Published by permission of the Secretary of the Smithsonian Institution.

† Bull. Torrey Club **26**: 205–216. 15 My 1899.

Lamina 15–30 cm. long; pinnae auriculate at the upper base, the auricles usually overlapping the rachis, the margins elsewhere serrate or often deeply incised. 6. *P. auriculata.*

Lamina 40–90 cm. long; pinnae not auriculate.

Pinnae 12–15 cm. long, mostly falcate; veins 1.5–3 mm. apart at the base, the veinlets very close; sori small; margins slightly cartilaginous, nearly all the outer veinlets prolonged into slender awnlike antrorse teeth. 4. *P. nobilis.*

Pinnae 18–25 cm. long, usually very much broader (3–4 cm.); veins 4–6 mm. apart at the base, branched at a much wider angle; sori very large; margins heavily cartilaginous, the marginal teeth stout and short, one to each group of veinlets. 7. *P. macrosora.*

1. PHANEROPHLEBIA JUGLANDIFOLIA (H. & B.) J. Sm.

In addition to Dr. Underwood's description it may be noted that the rhizome is woody, relatively slender (about 1 cm. in diameter), 10 cm. long, or less, decumbent and without exception strongly curved. The small crown is densely clothed within with thin dark brown deltoid-oblong laxly ciliate scales, mostly with lighter brown margins. A few similar scales are borne at intervals along the strongly sulcate greenish or stramineous stipe. Both this and the next species are remarkable for the length of the stipe, which is usually much greater than that of the lamina. The characters of venation and position of sori mentioned above in the key appear to be constant, in the case of normally well-developed plants.

As observed by the writer in Alta Verapaz, Guatemala (*Maxon & Hay* 3289), and in the mountains of Chiriqui (*Maxon* 4935, 5192, 5544), at from 900 to 1,500 meters elevation, *P. juglandifolia* grows in deep shade, on very humid heavily forested slopes. Additional specimens, not cited by Dr. Underwood, are as follows:

COSTA RICA: Alajuelita, altitude 900 meters, *John Donnell Smith* 8074; collected by A. Alfaro, original number 103.

GUATEMALA: San Miguel Uspantan, altitude 6,000 ft., *John Donnell Smith* 3259;* collected by Heyde and Lux. Coban, Alta Verapaz, altitude 1,350 meters, *H. von Türckheim* II. 1856.

* The balance of this number in the National Herbarium (3 sheets) is *P. remotispora.*

The Coban plants, which are only partially fertile and are aberrant in the position of the sori, were listed* incorrectly by the writer as *P. remotispora*.

2. PHANEROPHLEBIA PUMILA (Mart. & Gal.) Fée.

Of this species only the following material has been seen by the writer:

MEXICO: Top of the Sierra Madre, near Chilpancingo, Guerrero, *E. W. Nelson 2222* (2 sheets).

3. PHANEROPHLEBIA REMOTISPORA Fourn.

There are in the National Herbarium three sheets of specimens of this species from the vicinity of Cordoba, Vera Cruz, collected by Hugo Fink, 1889–1891, no. 60, and not listed by Dr. Underwood. Two of these respresent fertile fronds which appear quite typical; the third is of a plant with four fronds (30 to 50 cm. high), three of which are sterile, the fourth partially fertile and showing the true characters of the species in the position of its sori. The rhizome, which is not very complete, appears to have been short and nearly erect; it is clothed with thin delicate pale brown laxly ciliate-fibrillose scales of oblong-ovate form. A few scales of similar character occur sparingly upon the lower part of the stipe, and mixed with them are others that are nearly capillary and of a rusty color. These last extend along the stipe and rachis throughout, but are readily abraded. The pinnae of this young and nearly sterile plant are narrowly ovate or oblong-ovate, 10 to 12 cm. long, 2.5 to 3 cm. broad (3.5 in one pinna), strongly falcate, long-acuminate and caudate. The margins are conspicuously long-spinulose nearly or quite to the base of the pinna (the spines very oblique or appressed), in this respect differing widely from *P. juglandifolia*.

An additional specimen is:

MEXICO: Orizaba, altitude 4,000 ft., Aug. 26, 1891, *Henry E. Seaton* 49; distributed as *Hemitelia* sp.

4. PHANEROPHLEBIA NOBILIS (Schlecht.) Fée.

A species readily distinguished by the characters noted in the key. The margins are, naturally, more freely spinulose in the

* Contr. U. S. Nat. Herb. 13: 20. 1909.

sterile fronds, the numerous teeth being almost wholly correlated with those outer veinlets that extend to the margin.

A single new specimen:

MEXICO: Ixtaccihuatl, *C. A. Purpus* in 1905, 1595.

5. PHANEROPHLEBIA UMBONATA Underw.

A unique species, not to be confused readily with any other of the genus. A single additional specimen has been received:

MEXICO: Sierra Madre, above Monterey, Nuevo Leon, altitude 3,000 ft., March 12, 1906, *Pringle* 13739.

6. PHANEROPHLEBIA AURICULATA Underw.

This species is noteworthy not only for its auriculate and often incised pinnae, but for its thin, almost membranous texture.

The following additional specimens have been received:

NEW MEXICO: Van Patten's Camp, Organ Mountains, Doña Ana County, altitude about 6,300 ft., *Wooton*, May 14, 1899, and March 5, 1902. Filmore Cañon, Organ Mountains, Doña Ana County, *Wooton*, Feb. 28, 1904.

7. PHANEROPHLEBIA MACROSORA (Baker) Underw. Bull. Torrey Club **26**: 213. 1899

Aspidium juglandifolium var. *macrosorum* Baker, Journ. Bot. **25**: 25. 1887.

Phanerophlebia guatemalensis Underw. Bull. Torrey Club **26**: 214. 1899.

Complete material now at hand indicates very clearly that *P. guatemalensis*, founded upon John Donnell Smith's no. 3241, collected by Heyde and Lux at San Miguel Uspantan, Department of Quiché, Guatemala, altitude 7,000 ft., is identical with *P. macrosora*, which was described first as a variety by Baker based upon imperfect Costa Rican specimens collected by J. J. Cooper. Specimens of both type collections are in the National Herbarium, and in addition further very complete specimens from Guatemala, Costa Rica, and western Panama. These prove beyond all question the distinctness of the species as emended and indicate for it a probable continuous distribution along the higher mountains

of Central America. From this material the following description is drawn:

Rhizome very stout, decumbent, chaffy at the summit, bearing a semierect crown of 4 to 6 fronds, these 85 to 135 cm. long; stipes stout, 35 to 45 cm. long, 5 to 9 mm. thick at the base, at first very densely clothed on all sides with spreading light brown to dirty yellowish brown oblong to oblong-ovate scales, these 1 to 2 cm. long, of thin texture, or those toward the base thicker, glossy, and with darker brown centers, all delicately erose or lightly fimbriate-lacerate; lamina oblong to very broadly oblong in outline, 40 to 90 cm. long, 25 to 45 cm. broad, comprising 6 to 17 pairs of equal pinnae below the conform terminal segment of the same size; rachis very stout, strongly angled, copiously but deciduously chaffy, the scales narrow to nearly capillary, forming a loosely crispate covering; pinnae spreading or somewhat ascending, 4.5 to 7 cm. apart on each side, straight or nearly so (rarely falcate), 18 to 25 cm. long, 3 to 4 cm. broad,* sharply long-acuminate, narrowly oblong to oblong-lanceolate from a strongly inequilateral base, the upper side broadly cuneate and parallel to the rachis, the lower widely and abruptly excavate, all petiolate (the basal ones 5 to 10 mm.); leaf tissue coriaceous, the under surface bearing numerous minute setiform reddish scales, especially along the veins; veins 4 to 6 mm. apart at the base, evident, or below conspicuously elevated, 3- to 5-forked, the lowest proximal branch usually extending nearly to the margin; margins strongly cartilaginous, the marginal teeth stout and short, almost invariably only one to each group of veinlets; sori (except with age) very large, 2 to 3 mm. in diameter, hemispheric, distinctly inframedial as to the veinlets, 1 to 4 to each group, forming 1 to 4 lines (the outer ones often incomplete) upon each side of the midvein, the first row usually about 1 to 2 mm. distant, the others close or apart, never extending to the vicinity of the margin; indusia ample, but delicate and usually early withering.

Specimens examined in the National Herbarium:

COSTA RICA: Without definite locality, *J. J. Cooper* (type collection). Forêts du Tittoral, southeastern slope of Volcano Irazu, altitude 2,400 meters, *Pittier* 848. Forêts du Copey, altitude 1,800 meters, *Tonduz* 11930.

GUATEMALA: San Miguel Uspantan, Depart. Quiché, altitude 7,000 ft., *J. D. Smith* (Heyde & Lux) 3241 (type collection of *P.*

* In one exceedingly fertile frond only 2 cm. broad.

guatemalensis). Volcano Atitlan, Depart. Sololá, *W. A. Kellerman* 5774.

PANAMA: Vicinity of Camp Aguacatal, eastern slope of Chiriqui Volcano, altitude 2,100 to 2,300 meters, March 10–13, 1911, *Maxon* 5273, 5290.

WASHINGTON, D. C.

INDEX TO AMERICAN BOTANICAL LITERATURE

(1910-1911)

The aim of this Index is to include all current botanical literature written by Americans, published in America, or based upon American material; the word America being used in the broadest sense.

Reviews, and papers that relate exclusively to forestry, agriculture, horticulture, manufactured products of vegetable origin, or laboratory methods are not included, and no attempt is made to index the literature of bacteriology. An occasional exception is made in favor of some paper appearing in an American periodical which is devoted wholly to botany. Reprints are not mentioned unless they differ from the original in some important particular. If users of the Index will call the attention of the editor to errors or omissions, their kindness will be appreciated.

This Index is reprinted monthly on cards, and furnished in this form to subscribers at the rate of one cent for each card. Selections of cards are not permitted; each subscriber must take all cards published during the term of his subscription. Correspondence relating to the card issue should be addressed to the Treasurer of the Torrey Botanical Club.

Arthur, J. C. Some Alaskan and Yukon rusts. Plant World **14**: 233–236. O 1911.

Banker, H. J. *Steccherinum septentrionale* (Fr.) Banker in Indiana. Proc. Indiana Acad. Sci. **1910**: 213–218. 1911. [Illust.]

Barker, E. E. Notes on the royal moccasin flower. Plant World **14**: 190–194. *f. 3*. Au 1911.

Bather, F. A., & Calman, W. T. Transference of the term "genotype." Science II. **34**: 685. 17 N 1911.

Bicknell, E. P. The ferns and flowering plants of Nantucket—VIII. Bull. Torrey Club **38**: 447–460. 4 N 1911.

Blumer, J. C. Change of aspect with altitude. Plant World **14**: 236–248. O 1911.

Brainerd, E. Cyrus Guernsey Pringle. Rhodora **13**: 225–232. 25 N 1911. [Illust.]

Britton, E. G. Fungi on mosses. Bryologist **14**: 103. N 1911.

Britton, N. L. Report on a visit to the Royal Gardens, Kew, England, and to the British Museum of Natural History. Jour. N. Y. Bot. Gard. **12**: 215–218. O 1911.

Brown, N. E. *Caladium pubescens*. Curt. Bot. Mag. IV. **7**: *pl. 8402*. N 1911.

A plant from Peru.

Campbell, D. H. A sketch of the history of plant morphology in America. Plant World **14**: 105–110. My 1911.

Cardot, J. Note sur les mousses rapportées par la seconde expédition antarctique française, sous le commandement du Dr. Jean Charcot. Rev. Bry. **38**: 124–127. 1911.

Chittenden, F. J. The effect of the frosts of the winter of 1908–09 on vegetation. Jour. Royal Hort. Soc. **36**: 358–404. N 1910.

Christ, H. On *Psomiocarpa*, a neglected genus of ferns. Smithsonian Misc. Coll. **56**[23]: 1–3. *pl. 1 + f. 1.* 21 N 1911.
Includes *Psomiocarpa Maxoni* sp. nov. from Jamaica.

Chrysler, M. A. More botanical errors. Science II. **34**: 603. 3 N 1911.

Clark, C. F. Observations on the blooming of timothy. Plant World **14**: 131–135. *f. 1, 2.* Je 1911.

Clinton, G. P. Report of the botanist 1908. Report Connecticut Agr. Exp. Sta. **1907–1908**: 849–934. *pl. 60–74.* Jl 1909.

Clute, W. N. The flora of the Chicago plain. Am. Bot. **17**: 65–70. Au 1911. [Illust.]

Clute, W. N., & Ferriss, J. H. A new species of *Phlox*. Am. Bot. **17**: 74–76. Au 1911.
Phlox argillacea sp. nov.

Coker, W. C., & Wilson, L. *Schizosaccharomyces octosporus*. Mycologia **3**: 283–287. *pl. 55 + f. 1, 2.* N 1911.

Cook, M. T. A common error concerning cecidia. Science II. **34**: 683–684. 17 N 1911.

Cook, M. T. Some problems in cecidology. Bot. Gaz. **52**: 386–390. 15 N 1911.

Cooper, W. S. Reproduction by layering among conifers. Bot. Gaz. **52**: 369–379. *f. 1.* 15 N 1911.

Copeland, E. B. New ferns from Sibuyan. Leaflets Philip. Bot. **4**: 1149–1152. 7 O 1911.
Includes descriptions of 6 new species.

Coulter, J. M. The endosperm of angiosperms. Bot. Gaz. **52**: 380–385. 15 N 1911.

Fairchild, D. Seeds and plants imported during the period from October 1 to December 31, 1910. U. S. Dept. Agr. Plant Ind. Bull. 227: 1–60. 2 N 1911.

Fernald, M. L. A pubescent variety of *Vaccinium vacillans*. Rhodora **13**: 235, 236. 25 N 1911.

Fink, B. Concerning botanical investigation in colleges. Science II. **34**: 593–595. 3 N 1911.

Fink, B., & Lantis, V. Climatic conditions and plant growth in southwestern Ohio in 1908 and 1909. Ohio Nat. **12**: 385–396. N 1911.

Fisher, M. L. Report of corn pollination—II. Proc. Indiana Acad. Sci. **1910**: 245. 1911.

Flynn, N. F. The sixteenth annual meeting of the Vermont Botanical Club. Rhodora **13**: 237, 238. 25 N 1911.

Free, E. E. Studies in soil physics—II. The movements of soil water. Plant World **14**: 59–66. Mr 1911;—III. Soil water and the plant. Plant World **14**: 110–119. My 1911;—IV. The physical constants of soils. Plant World **14**: 164–176. Jl 1911;—V. Soil temperature. Plant World **14**: 186–190. Au 1911.

Frier, G. M. Indiana weeds—their control and eradication. Proc. Indiana Acad. Sci. **1910**: 323–334. 1911. [Illust.]

Fuhrmeister, W. Jahresbericht der Deutschen Kakteen-Gesellschaft. Monats. Kakteenk. **21**: 146–148. 15 O 1911.

Gager, C. S. Cryptomeric inheritance in *Onagra*. Bull. Torrey Club **38**: 461–471. *pl. 20, 21 + f. 1, 2.* 4 N 1911.

Gates, F. C. An addition to the description of *Streptopus longipes* Fernald. Rhodora **13**: 237. 25 N 1911.

Gates, R. R. Mutation in *Oenothera*. Am. Nat. **45**: 577–606. O 1911.

Greene, E. L. Accessions to *Apocynum*. Leaflets **2**: 164. 18 N 1911.

Greene, E. L. The genus *Saviniona*. Leaflets **2**: 159–163. 18 N 1911.

Greene, E. L. Miscellaneous specific types—IV. Leaflets **2**: 153–159. 18 N 1911.

Continued from Leaflets **2**: 152. 11 My 1911.

Greenman, J. M. Some Canadian Senecios. Ottawa Nat. **25**: 114–118. N 1911.

Four new species described.

Greenwood, H. E. Some stages in the development of *Pellia epiphylla*. Bryologist **14**: 93–100. *pl. 15 + f. 38–40, 43.* N 1911.

Gussow, H. T. Plants causing skin irritations. Ottawa Nat. **25**: 112, 113. N 1911.

Harper, R. M. The relation of climax vegetation to islands and peninsulas. Bull. Torrey Club **38**: 515–525. 1 D 1911.

Harris, J. A. The distribution of pure line means. Am. Nat. **45**: 686–700. N 1911.

Hasse, H. E. Additions to the lichen flora of southern California—No. 6. Bryologist **14**: 100–102. N 1911.
Includes descriptions of 4 new species.

Hatchley, W. Y. Natural history notes. Jour. and Proc. Hamilton Assoc. Sci. **25, 26**: 122–124. 1910.

Heller, A. A. The North American lupines—V. Muhlenbergia **7**: 85–95. *pl. 6* + *f. 13–17*. 17 N 1911.
Describes *Lupinus oreganus*, *L. pallidipes*, and *L. Pipersmithii* spp. nov.

Hessler, R. Plants and man: Weeds and diseases. Proc. Indiana Acad. Sci. **1910**: 49–69. 1911.

Hill, A. J. Notes on some of the principal mosses of the coast region of British Columbia. Bryologist **14**: 103–106. N 1911.

Hill, A. W. South America in its relation to horticulture. Jour. Roy. Hort. Soc. **37**: 51–56. *f. 25–29*. O 1911.

Howe, M. A. The plant photograph exhibit. Jour. N. Y. Bot. Gard. **12**: 218–230. O 1911.

Howe, M. A. Phycological studies—V. Some marine algae of Lower California, Mexico. Bull. Torrey Club **38**: 489–514. *pl. 27–34* + *f. 1*. 1 D 1911.
Includes descriptions of 8 new species in *Cladophora* (1), *Dictyota* (1), *Scinaia* (1), *Anatheca* (1), *Gracilaria* (1), *Fauchea* (2), and *Halymenia* (1).

Hubbard, F. C. *Anthyllis Vulneraria* at Cromwell, Connecticut. Rhodora **13**: 240. 25 N 1911.

Hus, H. Frondescence and fasciation. Plant World **14**: 181–186. *f. 1, 2*. Au 1911.

Hus, H. The origin of species in nature. Am. Nat. **45**: 641–667. *f. 1–7*. N 1911.

Hus, H., & Murdock, A. W. Inheritance of fasciation in *Zea Mays*. Plant World **14**: 88–96. *f. 1*. Ap 1911.

Jennings, O. E. Notes on ferns of the Isle of Pines, West Indies. Am. Fern Jour. **1**: 129–136. 29 N 1911.

Jepson, W. L. The silva of California. Mem. Univ. Calif. **2**: 1–480. *pl. 1–85* + *f. 1–10* + *map 1, 2*. 29 D 1910.

Johnson, A. G. Further notes on timothy rust. Proc. Indiana Acad. Sci. **1910**: 203, 204. 1911.

Kennedy, P. B. Alpine plants—I. Muhlenbergia **7**: 95, 96. *f. 18*. 17 N 1911.

Kern, F. D. The rusts of Guatemala—II. Mycologia **3**: 288–290. N 1911.
Uromyces Gouaniae sp. nov. described.

Klugh, A. B. *Festuca occidentalis* in Ottawa. Ottawa Nat. **25**: 123. N 1911.

Knowlton, C. H., *and others*. Report on the flora of the Boston district. Rhodora **13**: 232–235. 25 N 1911.

Koidzumi, G. Plantae siphonogamae a N. Yokoyama anno 1907 in Alaska arctica, Tschuktschore et Kamtschatka collectae. Bot. Mag. **25**: 203–222. O 1911.

Kunze, R. E. Beiträge zur sicheren Unterscheidung von *Echinocactus Wislizeni* Engelm. u. *E. Lecontei* Engelm. Monats. Kakteenk. **21**: 156. 15 O 1911.

Land, W. J. G. An electrical constant temperature apparatus. Bot. Gaz. **52**: 391–399. *f. 1–4*. 15 N 1911.

Lemoine, [M.] Structure anatomique des Mélobésiées. Application à la classification. Ann. Inst. Océanog. **2²**: 1–213. *pl. 1–5*. 15 F 1911.

Lewis, I. M. The seedling of *Quercus virginiana*. Plant World **14**: 119–123. *f. 1–10*. My 1911.

Livingston, B. E. A radio-atmometer for comparing light intensities. Plant World **14**: 96–99. Ap 1911.

Livingston, B. E. The relation of the osmotic pressure of the cell sap in plants to arid habitats. Plant World **14**: 153–164. Jl 1911.

MacDougal, D. T. Climatic selection in a hybrid progeny. Plant World **14**: 129–131. *f. 1*. Je 1911.

MacDougal, D. T. Induced and occasional parasitism. Bull. Torrey Club **38**: 473–480. *pl. 22–25*. 4 N 1911.

MacDougal, D. T. The inheritance of habitat effects by plants. Plant World **14**: 53–59. N 1911.

MacDougal, D. T. The water relations of desert plants Pop. Sci. Mo. **79**: 540–553. *f. 1–5*. D 1911.

McMurray, N. A sunny crop. Am. Bot. **17**: 70–72. Au 1911.

Macnamara, C. Notes on native orchids. Ottawa Nat. **25**: 118–121. N 1911.

Marchal, E. Apparition en Belgique de l'oidium americain du grosseillier. (*Sphaerotheca Mors-Uvae* Berk. et Curt.) Bull. Soc. Roy. Bot. Belgique **46**: 337, 338. 1 Mr 1910.

Markle, M. S. Two pine gametophytes in one ovule. Proc. Indiana Acad. Sci. **1910**: 321. 1911. [Illust.]

Maxon, W. R. A remarkable new fern from Panama. Smithsonian Misc. Coll. **56²⁴**: 1–5. *pl. 1, 2*. 22 N 1911.

Polypodium podocarpum sp. nov.

Metcalf, H., & Collins, J. F. The control of the chestnut bark disease. U. S. Dept. Agr. Farmers' Bull. 467: 1–24. 28 O 1911.

Meyer, R. *Echinopsis apiculata* u. *E. Salmiana*. Monats. Kakteenk. **21**: 160. 15 O 1911.

Meyer, R. Einiges über *Echinocactus recurvatus* Lk. et Otto und seine Varietäten. Monats. Kakteenk. **21**: 148–152. 15 O 1911. [Illust.]

Murrill, W. A. The *Agaricaceae* of tropical North America—IV. Mycologia **3**: 271–282. N 1911.

Includes descriptions of 21 new species in *Leptoniella* (4), *Eccilia* (3), *Nolanea* (2), *Pluteus* (6), *Entoloma* (1), *Pleurotus* (1), and *Volvariopsis* (4).

Nelson, A. Contribution from the Rocky Mountain Herbarium—IX. New plants from Idaho. Bot. Gaz. **52**: 261–274. 17 O 1911.

Fifteen new species described.

Orton, C. R. Disease resistance in varieties of potatoes. Proc. Indiana Acad. Sci. **1910**: 219–221. 1911.

Pearl, R., & Bartlett, J. M. The Mendelian inheritance of certain chemical characters in maize. Zeits. Induk. Abst. und Vererbungslehre **6**: 1–28. O 1911.

Peirce, G. J. American botany. Plant World **14**: 81–87. Ap 1911.

Peirson, H. Abnormal development in maize. Jour. Bot. **49**: 347, 348. N 1911.

Petry, L. C., & Markle, M. S. An ecological survey of Whitewater Gorge. Proc. Indiana Acad. Sci. **1910**: 223–243. *f. 1–9*. 1911.

Phillips, F. J. Conifers without normal whorls. Plant World **14**: 66–69. *f. 1*. Mr 1911.

Pretz, H. W. An interesting find. Am. Fern Jour. **1**: 137–141. 29 N 1911. [Illust.]

Asplenium Bradleyi D. C. Eaton.

Quehl, L. *Mamillaria Caput-Medusae* Otto var. *centrispina* Salm-Dyck. Monats. Kakteenk. **21**: 152. 15 O 1911.

Quehl, L. *Mamillaria Seideliana* Quehl nov. spec. Monats. Kakteenk. **21**: 154, 155. 15 O 1911. [Illust.]

Richter, M. C. Honey plants of California. Univ. Calif. Agr. Exp. Sta. Bull. 217: 973–1037. *f. 1–14*. Je 1911.

Robinson, B. L. Notes on the genus *Cirsium*. Rhodora **13**: 238–240. 25 N 1911.

Rohrer, J. B. Report of mycologist for year ending March 31, 1911—(Part II). Board of Agr. Trinidad and Tobago Circ. 4: 1–70. *pl. 1–13*. 20 O 1911.

Safford, W. E. Edward Palmer. Am. Fern Jour. **1**: 143–147. 29 N 1911.

Safford, W. E. Notes of a naturalist afloat—I. Am. Fern Jour. **1**: 121–129. *pl. 5*. 29 N 1911.

Schindler, A. K. *Halorrhagaceae* novae—I. Repert. Sp. Nov. **9**: 123–125. 15 Ja 1911.
Gunnera Margaretae Schindler from Peru.

Sherff, E. E. A new variety of *Carex lupulina*. Bull. Torrey Club **38**: 481, 482. *pl. 26*. 4 N 1911.
Carex lupulina albomarginata var. nov.

Shreve, F. The influence of low temperature on the distribution of the giant cactus. Plant World **14**: 136–146. *f. 1–3*. Je 1911.

Shull, G. H. Reversible sex-mutants in *Lychnis dioica*. Bot. Gaz. **52**: 329–368. *f. 1–15*. 15 N 1911.

Smith, R. I., & Stevens, F. L. Insects and fungous diseases of apple and pear. North Carolina Agr. Exp. Sta. Bull. 206: 43–126. Mr 1910.

Stapf, O. *Phyllodoce amabilis*. Curt. Bot. Mag. IV. **7**: *pl. 8405*. N 1911.

Stapf, O. *Ruellia Devosiana*. Curt. Bot. Mag. IV. **7**: *pl. 8406*. N 1911.
A native of Brazil.

Stearns, E. Three big perennial roots. Am. Bot. **17**: 73–74. Au 1911.

Steil, W. N. Apogamy in *Pellaea atropurpurea* Bot. Gaz. **52**: 400, 401. 15 N 1911.

Stuckert, T. Tercera contribución al conocimiento de las Graminàceas argentinas. An. Mus. Nac. Buenos Aires **14**: 1–218. *pl. 1–4*. 1911.

Terry, E. H. Grace A. Woolson. Am. Fern Jour. **1**: 148, 149. 29 N 1911.

Townsend, C. W. A comment on the use of the term Labrador in natural history. Rhodora **13**: 236, 237. 25 N 1911.

Türckheim, H. von. Botanische Forschungsreise in Santo Domingo in den Jahren 1909 und 1910. Allgem. Bot. Zeits. **17**: 129–135. N 1911.

Van Hook, J. M. Indiana fungi. Proc. Indiana Acad. Sci. **1910**: 205–212. 1911.

Wangerin, W. *Cornaceae*. Pflanzenreich 4^{229}: 1–101. *f. 1–24*. 12 Ap 1910.

Wangerin, W. *Garryaceae*. Pflanzenreich 4^{56a}: 1–18. *f. 1–5*. 12 Ap 1910.

Wangerin, W. *Nyssaceae*. Pflanzenreich 4^{220a}: 1–19. *f. 1–4*. 12 Ap 1910.

Weigel, W. G., & Frothingham, E. H. The aspens: their growth and management. U. S. Forest Serv. Bull. 93: 1–35. 31 My 1911.

Weingart, W. *Cereus coerulescens* S.-D. var. *melanacanthus* K. Schum. Monats. Kakteenk. **21**: 139–140. 15 S 1911.

Weingart, W. *Cereus monacanthus* Lem. Monats. Kakteenk. **21**: 157–160. 15 O 1911.

Weiss, F. E. The British Assocation for the Advancement of Science. Address to the botanical section. Science II. **34**: 464–480. 13 O 1911.

Wernham, H. F. Supplemental note on *Hamelia*. Jour. Bot. **49**: 346. N 1911.

Hamelia Brittoniana sp. nov. described.

Wieland, G. R. On the Williamsonian tribe. Am. Jour. Sci. IV. **32**: 433–466. *f. 1–18*. D 1911.

Wieland, G. R. Recent contributions on cycadophytans. Am. Jour. Sci. IV. **32**: 473–476. *f. 20*. D 1911.

Williams, I. C. Additional facts about the chestnut blight. Science II. **34**: 704, 705. 24 N 1911.

Wilson, E. H. New Chinese plants. Horticulture **14**: 626–628. 4 N 1911.

Wilson, E. H. The kingdom of flowers. An account of the wealth of trees and shrubs of China and of what the Arnold Arboretum, with China's help, is doing to enrich America. Nat. Geog. Mag. **22**: 1003–1035. N 1911. [Illust.]

Includes numerous photographs of named Chinese trees, etc.

Wilson, W. B. A rare Mexican cycad. Trans. Kansas Acad. Sci. **23, 24**: 132–137. Ja 1911. [Illust.]

Dioon edule.

Winslow, E. J. *Lycopodium flabelliforme*. Am. Fern Jour. **1**: 141–143. 29 N 1911.

Witton, H. B. Diatoms. What they are and where they are found Jour. and Proc. Hamilton Assoc. Sci. **25, 26**: 38–46. 1910.

Wolff, H. *Umbelliferae-Apioideae-Bupleurum, Trinia* et reliquae *Ammineae* heteroclitae. Pflanzenreich 4^{228}: 1–214. *f. 1–24*. 2 Au 1910.

Wooster, L. C. The origin and development of plant and animal instincts. A theory of evolution in which life is the central agent. Trans. Kansas Acad. Sci. **23, 24**: 227–231. Ja 1911.

Zon, R., & Briscoe, J. M. Eucalypts in Florida. U. S. Forest Serv. Bull. 87: 1–47. *pl. 1–5* + *f. 1*. 29 Ap 1911.

Zon, R., & Graves, H. S. Light in relation to tree growth. U. S. Forest Serv. Bull. 92: 1–59. *f. 1–10*. 30 Je 1911.